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Psychometric Performance of Attitudes towards Aging Questionnaire Chinese Version for the Elderly in Guangdong

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Abstract

Objective To analyze the psychometric performance of Attitudes towards Aging Questionnaire Chinese Version (AAQ-CV) for the elderly in Guangdong. **Methods** A stratified random sampling was used to select 1109 old people from 5 cities in Guangdong province, and AAQ-CV was used to investigate them. The floor and ceiling effects were used to evaluate its sensitivity. And then, Cronbach's α coefficients were used to analyze the internal consistency of the questionnaire, and Convergent validity, discriminant validity, and factor analysis were used to evaluate its structural validity. Finally, the total score of the Geriatric Depression Scale Short Form (GDS-15) was used as the calibration criterion to verify the simultaneity calibration validity of AAQ-CV. **Results** First, the total score of AAQ and the scores of three dimensions were all governed by the normal distribution, without any floor or celling effect. Second, the Cronbach's α coefficient of the total questionnaire was 0.823, and the Cronbach's α coefficients of the 3 dimensions of dealing with physical change (DPC), loss of psychosocial function (LPF), and psychological attainment (PA) were 0.717, 0.615 and 0.809 respectively, which met with the requirements of the group comparison. Third, the calibration success rates of convergent validity of DPC, LPF, and PA were 87.50%, 87.50% and 100%, respectively. The calibration success rates of discriminant validity of DPC, LPF, and PA were 93.80%, 87.50%, and 100% respectively. Forth, three components obtained from factor analysis basically reflect the theoretical conception of AAQ-CV, with a cumulative variance contribution rate of 44.772%. Final, the total score of AAQ-CV and scores of DPC, LPF, and PA all negatively predicted the total score of GDS-15. **Conclusions:** The psychometric performance of AAQ-CV for the elderly in Guangdong was valid and reliable.

Key words: Attitudes towards aging; Validity; Reliability; Sensitivity; The elderly

1. Introduction

Population aging is a common population problem faced by countries around the world in the 21st century. Compared with other countries, China's situation of aging population is particularly severe, and "getting old before getting rich" and "getting old before getting prepared" are the realistic national conditions [1]. In the face of the increasingly large elderly population and the accelerating aging process, improving the social participation of the elderly and achieving their retirement, care, and enjoyment are important countermeasures. Based on this task, we need to timely and deeply understand the public's attitudes towards aging.

Aging attitudes refer to the experience and evaluation of people towards their own aging [2]. Previous studies have shown that attitudes towards aging are the independent predictors of healthy aging [3]. Different attitudes towards aging have different impacts on the physiology and psychology health of the elderly. Positive attitudes towards aging can promote their physical and mental health and improve their quality of life [4-5].

As a subjective cognitive concept, the connotation of aging attitudes is rich, and the development and application of the measurement tools are still limited. The mainstream way for the current academic community to measure attitudes towards aging is to operationalize them into specific scales to quantitatively evaluate their intensity. There are various types of related scales abroad, targeting different groups, measurement purposes, and closely related content such as aging knowledge, ageism, stereotypes, and implicit attitudes. In addition, these scales are constantly updated and developed. The existing scales have made the measurement and research more detailed, but due to the different measurement objects like nursing staff, college students, or elderly people, and purposes, there are significant differences in measurement dimensions, and their applicability and measurement performance are different [6]. It is the primary task of users to have a detailed understanding of the content and measurement performance of each scale.

The main tools used to evaluate attitudes towards aging in China are the introduction and revision of existing scales abroad. Among them, the Attitudes to Aging Questionnaire (AAQ) is one of the earliest and most widely used scales. AAQ was developed by Laidlaw (2007) [2] using samples from 20 countries. The development of the AAQ took into account the influence of Eastern culture, which reliability and validity tests were conducted with data collected in Japan, and Huang Yifan et al. (2010) [7] also conducted applicability tests when revising the Chinese version. However, as the birthplace of Eastern culture, Confucianism has a deeper influence on China, and its social, cultural, and ideological characteristics are different from those of Japan [8], as well as from the economic and cultural characteristics of China as revised by Huang Yifan (2010) [7]. Therefore, it is necessary to test the metrological performance of AAQ in the current Chinese cultural context. However, in the past 14 years, there has been a lack of systematic research on the measurement performance of AAQ in China, and only a few studies have provided its Cronbach's α coefficients when using AAQ as a research tool.

2. Objects and Methods

2.1. Objects

2.1.1. Sample size estimation

G* Power 3 is used to calculate the minimum sample size [9], and the prevalence rate of depression among the elderly is adopted to calculate the sample size. Previous studies have shown that the incidence of depression among the elderly in China is 6.50% to 63.50%, with a medium test effect value[10-12], which means d value is 0.50 to 0.80 [13]. In this study, with the effect value d = 0.70, the statistical test power of 1-β=0.80, the type I error probability α= 0.05, and the minimum sample size is calculated as 786. The minimum sample size is determined as 943 due to a 20% of possible follow-up loss rate.

2.1.2. Sampling

A stratified random sampling was used to select 1200 elderly people from 5 cities in Guangdong Province including Shenzhen, Dongguan, Zhuhai, Shanwei, and Heyuan from January 2023 to March 2023. Among them, there are 600 elderly residents in nursing homes and 600 elderly residents at home. Inclusion criteria: Over 60 years old, with normal mental and intellectual health, and elderly residents living in nursing homes for more than six months. Exclusion criteria: Those who are unable to complete the scales due to dementia, severe physical illness, mental disorders, or other reasons. 1149 people actually met, with a visit rate of 95.8%. Eight people (0.6%) were excluded from mental disorders and positively tested for the Mini-Mental State Examination (MMSE). Twenty people (1.7%) found it impossible to answer questions due to severe hearing and visual impairments, as well as 12 (1.1%) reported discomfort or unwillingness to cooperate with the survey. A total of 1109 people completed various surveys, with a survey efficiency of 92.4%. Among them, there are 297 in Dongguan, 330 in Shenzhen, 172 in Zhuhai, 159 in Shanwei, and 151 in Heyuan; 545 elderly residents (290 males and 255 females) in nursing homes, 564 elderly residents (285 males and 279 females) at home; The average age is (68.6 ± 8.92) years old, with 560 people aged 60-70, 472 people aged 70-80, and 77 people aged 80-90; 84 unmarried, 479 widowed, 546 married with surviving spouses; Average education years (9.75 ±3.89), with 133 illiterate, 379 primary school graduates, 327 junior high school graduates, 173 high school or technical secondary school graduates, 49 junior college graduates, 36 undergraduate graduates, and 12 master's or above graduates; 404 people in cities, 394 in towns, and 311 in rural areas; 53 people live alone, 360 live with their spouses, 134 live with their children, 208 live with their spouses and children; 354 live in nursing homes. The main source of income is as following: 482 retirees, 307 savings, 166 child providers, 98 other family members, 26 subsistence allowances, and 30 commercial insurance.

2.2. Tools

2.2.1. Attitudes to Aging Questionnaire, AAQ-CV

AAQ is Compiled by Laidlaw et al. (2007) [2], and revised by Huang Yifan et al. (2010) [7] into the Chinese version. It consists of 24 items, divided into three dimensions: Dealing with Physical Changes (DPC), Loss of Psychosocial Function (LPF), and Psychological Acquisition (PA). Each dimension has 8 items. The Likert 5-point scoring method is used to score from 1 to 5 points corresponding to “completely disagree” to “completely agree”. The higher the total score, the more positive the attitudes towards aging.

2.2.2. Geriatric Depression Scale Short Form, GDS-15

GDS-15 is compiled by Burke et al. (1991) [14], revised by Mei JR (1999) [15] into the Chinese version, and used for screening depression in the elderly. There are 15 items, including thoughts of low mood, reduced activity, irritability, withdrawal, and pain, as well as negative evaluations of the past, present, and future. The 2-level scoring method is used to score from 0 to 1 point corresponding to "no" and "yes". The highest score is 15, generally speaking, 0-7 points indicate normal (without depression), 8-11 points indicate mild depression, and 12-15 points indicate moderate to severe depression. In this study, the Cronbach'a coefficient of the scale is 0.887.

2.2.3. Mini-Mental State Examination, MMSE

Also known as the simplified mental state checklist, MMSE is compiled by Folstein et al. (1975) [16] and revised by Zhang Mingyuan (2003) [17] into the Chinese version, it is mainly used for measuring cognitive function such as orientation, memory, language, computation, and attention. There are 5 items in total, including time and place orientation, language (i.e. retelling, naming, understanding instructions), mental arithmetic, immediate and short-term auditory word memory, and visual structure imitation. The highest total score is 30, with a cutoff value of ≤ 17 points for the illiterate group, ≤ 20 points for the primary school group, and ≤ 24 points for the middle school group or above. A score below the cutoff value indicates cognitive impairment. The scale has high reliability, validity, specificity, and sensitivity. In this study, the Cronbach's α coefficient of MMSE is 0.813.

2.2.4. A self-compiled questionnaire on the general personal information

It includs 8 items, namely gender, age, the city and area where you reside, marital status, elderly care methods, education level, source of income.

2.3. Collection and organization of data

Before the investigation, the researchers who participated in the survey were given unified training, and the survey process and rating standards were also unified. The consistency test (Kappa=0.81 to 0.90) was conducted to meet the requirements of psychological measurement.

Through the checking way of meeting at home, questionnaires were given out by investigators and the elderly were invited to fill in by themselves. For those who cannot complete the questionnaire alone due to illiteracy or other reasons, investigators would read out the questions in a uniform way and make objective records according to answers.

The questionnaires with answers of more than 50% of the items missing were eliminated. The missing values of the valid questionnaires were estimated and filled with the average values. Two researchers independently input the same data with Epidata3.0 software and conduct a unified logic check so as to ensure the accuracy of the data.

2.4. Data processing

Data was exported from Epidata3.0 to SPSS 20.0 software for statistics and analysis. In the first step, the original scores of 24 items were calculated based on the answers. In the second step, the total score of AAQ-CV and the average score and standard deviation of each dimension were calculated. In the third step, the Cronbach's α coefficients were used to evaluate the internal consistency reliability. In the fourth step, the convergent and discriminant validity were calculated. In the fifth step, principal component factor analysis was performed on 24 items. Finally, with the total score of GDS-15 as the calibration criterion, the simultaneity calibration validity of AAQ-CV was calculated.

3. Results

3.1. The distribution of AAQ-CV scores

The ceiling/floor effect is one of the psychological testing effects, which refers to the phenomenon that when the scores of most participants approach or reach the upper/lower limits of the scores when a task or test is too simple/complex, resulting in a decrease in the evaluation and prediction performance [18]. Table 1 shows that the total score of AAQ-CV and the scores of the three dimensions tend to be normally distributed because the Skewness coefficients range from (-0.022) to 0.178, Kurtosis coefficients range from 0.130 to 0.621, and the absolute values of these coefficients are significantly less than 1. Therefore, there is no floor effect or ceiling effect.

Table 1. Descriptive statistics of AAQ-CV (n = 1109)

Dimension	Item number	X±s	Min	Max	P25	P50	P75	Floor[n(%)]	Celling[n(%)]
DPC	8	25.64±5.15	8.00	39.00	22.00	26.00	29.00	7(0.6)	5(0.5)
LPF	8	27.33±3.46	14.00	38.00	25.00	27.00	30.00	0(0)	2(0.2)
PA	8	22.51±4.13	8.00	32.00	20.00	22.00	25.00	4(0.4)	0(0)
AAQ-CV	24	75.48±9.93	42.00	106.00	69.00	76.00	82.00	0(0)	0(0)

3.2. Internal consistency reliability of AAQ-CV

The Cronbach's α coefficient is used to measure the internal consistency reliability of total scale and 3 dimensions. It is generally believed that When the Cronbach's α coefficient is greater than 0.70, the internal consistency reliability is better. As shown in Table 2, the Cronbach's α coefficient of the total scale is 0.823, and those of the three dimensions are 0.717, 0.615, and 0.809, respectively. There is a low to moderate pairwise correlation among three dimensions.

Table 2. Cronbach's α coefficients of and correlation coefficients between dimensions

Dimension	*Cronbach's α*	1	2	3	4
1. DPC	.717				
2. LPF	.615	.517**			

3. PA	.809	.202**	.582**	
4. AAQ-CV	.823	.783**	.850**	.716**

** P<0.01

3.2 Validity of AAQ-CV

2.3.1 Convergent and Discriminant Validity

Convergent validity refers to the degree of similarity in measurement results when using methods to measure the same latent trait (construct), or the fact that indicators for measuring the same latent trait (construct) fall on the same common factor. Divergent validity, also known as discriminant validity, indicates that there should not be too much correlation between measurement results of different concepts [18].

The correlation coefficient (R) between each item and its dimension (factor) is used to represent the convergent validity. Usually, when R ≥ 0.4, it can be considered that the convergent validity is better. The discriminant validity is represented by the correlation coefficients between the item and other dimensions (factors). It is generally believed that if these correlation coefficients are lower than the correlation coefficient between the item and its dimension (factor), the discriminant validity is better [18]. The analysis results show that the 100% of correlation coefficients between PA and its items, 87.5% of correlation coefficients between DPC and its items, as well as 87.5% of correlation coefficients between LPF and its items are ≥ 0.4. The correlation coefficients between 100% of PA items, 93.80% of DPC items, and 87.50% of LPF items with other dimensions are smaller than the correlation coefficient between the item and the dimension it is located in. That is to say, the success rates of the convergent validity calibration of LPC, LPF, and PA are 87.50%/87.50% and 100% respectively, and the success rates of the discriminant validity calibration are 93.80%, 87.50%, and 100% respectively. See Table 3.

Table 3. Convergent validity and discriminant validity of AAQ-CV

Dimension	number of items	Convergent validity			Discriminant validity		
		range of R	success	success rate(%)	range of R	success	success rate(%)
DPC	8	.340 to .662	7/8	87.5	.025 to .509	15/16	93.8
LPF	8	.333 to .594	7/8	87.5	.033 to .655	14/16	87.5
PA	8	.599 to .736	8/8	100	.030 to .485	16/16	100

3.3.2 Construct validity

The KMO value is 0.895, and Bartlett's spherical test value is 5132.229 (df=43), with P<0.001. Therefore, the data is suitable for factor analysis. Three principal components are extracted from 24 items based on the eigenvalues greater than 1, with a cumulative contribution rate of 44.772%, which basically reflects the theoretical concept of the original scale. The loadings of 3 factors are shown in Table 4.

Table 4. Principal component analysis of 24 items of AAQ-CV and loadings of each factor (> 0.4)

1st principal component		2nd principal component		3rd Principal component	
item	factor load	item	factor load	item	factor load
9	.557	1	.746	17	.723
10	.635	2	.526	18	.659
11	.729	3	.537	19	.746
12	.450	4	.581	20	.692
13	.734	5	.742	21	.538
14	.572	6	.581	22	.667
15	.707	7	.597	23	.758
16	.459	8	.565	24	.615

3.3.3 Simultaneity calibration validity

First, taking the total score of AAQ-CV as the predictor variable and the total score of GDS-15 as the dependent variable, linear regression analysis is conducted within a 95% confidence interval. The result shows that the total score of AAQ-CV significantly negatively predicts that of GDS-15 (β=-0.528, P<0.001). Then, taking scores of three dimensions of AAQ-CV simultaneously as the predictor variables and the total score

of GDS-15 as the dependent variable, linear regression analysis is conducted within a 95% confidence interval. The results show that DPC, LPF, and PA all significantly negatively predict the total score of GDS-15 (β= -0.245, -0.097, -0.226; all P<0.05). The results are shown in Table 5.

Table 5. The predictive effects of AAQ-CV scores on GDS-15

Step	Dependent variable	Independent variable(s)	B	SE	β	t	P	R^2	R_{adj}^2
1	GDS-15	AAQ-CV	-.295	.036	-.528	-13.219	<.001	.279	.281
2	GDS-15	DPC	-.132	.018	-.245	-7.296	<.001		
		LPF	-.078	.032	-.097	-2.442	.015		
		PA	-.151	.023	-.226	-6.497	<.001		

4. Discussion

This study finds that the reliability and validity of AAQ-CV applied to elderly people in Guangdong are good, consistent with the results of similar literature [7, 19-21], indicating that AAQ-CV is suitable for evaluating attitudes towards aging among elderly people in Guangdong Province.

First, the results of ceiling/floor effect test indicate that the total score of AAQ-CV and the scores of three dimensions tend to be normally distributed, with no floor or ceiling effects. It is suggested that AAQ-CV has good sensitivity because the content is reasonable and can reflect the main connotation and hierarchical structure of aging attitudes, the sampling of this study is scientific and representative, and the statistical methods based on normal distribution are appropriate.

Second, AAQ-CV has good internal consistency reliability, and the specific explanation is as follows: The Cronbach's α coefficient of total scale and those of DPC, LPF, and PA are 0.823, 0.717, 0.615, and 0.809 respectively, which are consistent with the results of previous studies [7,19-21]. The suggestion is that when AAQ-CV is applied to elderly people with different demographic characteristics such as different regions or health conditions, its internal consistency reliability are within an acceptable range, and this conclusion can be verified with different statistical methods. However, the internal consistency reliability of the LPF in this study is below 0.70, which is also lower than the results of previous studies [7, 19-21], and the reason is likely due to different sample compositions. Previous studies have shown that the location of registered residence, economic status, education level, and physical health are important influencing factors of attitudes towards aging [7, 22-23]. The studies of Huang Yifan et al. [7], Wu Fang et al. [19], Chen Yantao et al. [20], and You Mei et al. [21] were all sampled from provincial capitals or municipalities directly under the central government. These regions have developed economies, good education, living, and medical conditions, which maintain better the physical health of the elderly and provide them with more sufficient psychological preparation for their physical and mental changes. At the same time, the life circle of these elderly people is broader, their life content is richer, and they enjoy higher participation rights in politics, economy, society, culture, and other aspects [23]. So they are more likely to contribute to society and experience the positive significance of elderly life, and they have a more consistent understanding of psychological and social loss and more positive evaluations. Relatively speaking, this group of elderly people was selected by stratified random sampling from Guangdong Province, and they can reflect the complex social stratification of the elderly population in Guangdong. It is precisely this complex social stratification that results in lower levels of economic ability, health status, social contact, social participation, and life content among the elderly in this group. However, there are significant individual differences, which leads to inconsistent understanding of psychological and social loss among them and fewer positive evaluations.

Third, the test results of structural validity including convergent validity, discriminant validity, and principal component analysis also indicate AAQ-CV has good psychometric performance.

On one hand, the success rates of the convergent validity calibration of LPC, LPF, and PA dimensions are 87.50%, 87.50%, and 100%, respectively, and the success rates of the discriminant validity calibration are 93.80%, 87.50%, and 100%, respectively. It can be seen that AAQ-CV has good convergent and discriminant validity, and can effectively include test indicators that measure the same latent trait (construct) on the same common factor while excluding irrelevant indicators.

On the other hand, there is a high correlation between the score of each dimension and the total score of AAQ-CV. 3 principal components are extracted from 24 items with a cumulative contribution rate of 44.772%, which is consistent with the research results of Huang Yifan [7] and basically reflects the theoretical concept of the original scale. There are different opinions on the dimension division of attitudes towards aging. The Questionnaire of Aging Attitude (QAA) developed by Li Chuanyun [24] divides attitudes towards aging into two factors. Although QAA has good reliability, its structural validity needs to be improved. The most important issue is that the two factors can only cumulatively explain 41.46% of the total variation. Furthermore, the number of items included in two factors is significantly different because factor one contains 16 items, and factor two contains 9 items, which significantly reduces the structural validity.

Final, the total score of AAQ-CV significantly negatively predicts the total score of GDS-15 (β=-0.528, P<0.001); and scores of DPC, LPF, and PA all significantly negatively predict the total score of GDS-15 (β=-0.245, -0.097, -0.226; all P<0.05). This result

suggests that AAQ-CV has a good simultaneity calibration validity.

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